RADIOCHEMICAL DETERMINATION OF CCRMP REFERENCE MATERIALS FOR CERTIFICATION PURPOSES: LEAD 210 ACTIVITY MEASUREMENTS.

FINAL REPORT

BY

SASKATCHEWAN RESEARCH COUNCIL

Work on this project was conducted under the auspices of the Canada Centre for Mineral and Energy Technology, Energy, Mines and Resources, Canada

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February 27, 1984

Dr. C.W. Smith
Energy Mines and Resources Canada
Canada Center for Mineral Technology
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Dear Clint:

With the repair of the multichannel analyzer last week I was able to complete the Pb-210 gamma spectroscopy measurements. These measurements were performed by placing the plastic petri dish containing 10 g of sample directly of top of the planar detector and then counting for an appropriate time period. After recording the result of this count a tubular spacer was placed on the detector surrounding the petri dish and extending above the detector surface for 25 cm. This arrangement gave a constant counting geometry for the americium-241 and barium-133 point sources. In the original count the Pb-210 line at 46.5 kev was measured and for the transmission measurement the lines were 31 kev (Ba-133), 59.5 kev (Am-241) and 81 kev (Ba-133). A plot of the percent transmission for the three lines was used to determine a transmission factor for the Pb-210 energy (46.5 kev). It turned out that the most consistent correction factor was obtained by a straight line extrapolation of the 81 kev and 59.5 kev percent transmission values to the 46.5 kev energy on a log-log plot. In addition to correcting for self absorption a correction for dead time losses was also made. The dead time correction obtained from the ADC does not take into account the amplifier dead time loss. For the particular system used here, an Aptec planar detector with a pulsed optical preamp feeding into a Canberra 2020 amplifier and then to the Nuclear Data 570 ADC, the amplifier dead time is approximately 3 times the ADC dead time. This relationship was used in calculating all dead time corrections.

The results of the gamma spectroscopy measurements are as follows:

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Sample	Pb-210 net cps	Trans. corr. @46.5 kev	Dead time correction	Pb-210 corr. cps	Pb-210 Bq/g
BL-5	8.86	0.66	1.0867	14.59	868
BL-5	8.63	0.64	1.0875	14.66	873
BL-5	8.90	0.65	1.087	14.88	886
BL-5	8.71	0.65	1.090	14.61	869
				mean	874 ± 8
DH-1a	0.407	0.78	1.007	0.525	31.3
DH-1a	0.426	0.79	1.0075	0.543	32.3
DH-1a	0.388	0.74	1.040	0.545	32.4
DH-1a	0.398	0.78	1.012	0.516	30.7
				mean	31.7 ± 0.8
BL-4a	0.204	0.79	1.005	0.260	15.4
BL-4a	0.211	0.82	1.0049	0.259	15.4
BL-4a	0.207	0.80	1.0045	0.260	15.5
BL-4a	0.198	0.79	1.005	0.252	15.0
				mean	15.3 ± 0.2
DL-1a	0.0193	0.82	1.004	0.0242	1.44
DL-1a	0.0198	0.81	1.0039	0.0245	1.46
DL-1a	0.0179	0.81	1.005	0.0222	1.32
DL-1a	0.0190	0.82	1.0035	0.0238	1.42
				mean	1.41 ± 0.06

In determining net Pb-210 counts per second a background of 0.003 counts per second has been subtracted. The total accumulated counts for DL-1a was approximately 1200 counts; for BL-4a it was 4000 counts; for DH-1a it was 10,000 counts; for BL-5 it was 22,000 counts.

The radiochemical determination of Pb-210 was performed according to the procedure on p.19 of Canmet Report 78-22. The results are as follows:

Sample	Total Counts approximate	Pb-210 Bq/g
BL-5	550,000	861
BL-5	550,000	875
BL-5	550,000	861
BL-5	550,000	874
	mean	868 ± 8

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Sample	Total Counts approximate	Pb-210 Bq/g
DH-1a	20,000	30.0
DH-1a	20,000	31.7
DH-1a	20,000	30.8
DH-1a	20,000	32.0
	mean	31.1 ± 0.9
BL-4a	10,000	15.1
BL-4a	10,000	15.4
BL-4a	10,000	15.1
BL-4a	10,000	15.3
	mean	15.2 ± 0.2
DL-1a	2000	1.43
DL-1a	2000	1.40
DL-1a	2000	1.41
DL-1a	2000	1.42
	mean	1.42 ± 0.01

These radiochemical results were calculated using the lead-210 standard supplied with the samples. This makes the results about 8% higher than if we used our old Amersham Pb-210 standard. This is probably reasonable however as our stock standard has probably undergone some evaporation over the course of the past 4 years which would make its concentration high and the results low.

This completes the contract and I have included the contract papers for your approval Clint.

Best regards,

Gene Smithson, Ph.D.
Manager
Analytical Services Sector

GS/ldd

Encl.

POOR

QUALITY

ORIGINAL